



# **System Administrator for LCS Development Sets**

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# System Administrator for LCS Development Sets

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The Spaceport Command and Control System Project is creating a Checkout and Control System that will eventually launch the next generation of vehicles from Kennedy Space Center. KSC has a large set of Development and Operational equipment already deployed in several facilities, including the Launch Control Center, which requires support. The position of System Administrator will complete tasks across multiple platforms (Linux/Windows), many of them virtual. The Hardware Branch of the Control and Data Systems Division at the Kennedy Space Center uses system administrators for a variety of tasks. The position of system administrator comes with many responsibilities which include maintaining computer systems, repair or set up hardware, install software, create backups and recover drive images are a sample of jobs which one must complete. Other duties may include working with clients in person or over the phone and resolving their computer system needs. Training is a major part of learning how an organization functions and operates. Taking that into consideration, NASA is no exception. Training on how to better protect the NASA computer infrastructure will be a topic to learn, followed by NASA work policies. Attending meetings and discussing progress will be expected. A system administrator will have an account with root access. Root access gives a user full access to a computer system and or network. System admins can remove critical system files and recover files using a tape backup. Problem solving will be an important skill to develop in order to complete the many tasks.

## I. Introduction

The Ground Systems Development and Operations Program (GSDO) primary role is to prepare the center for the future coming of space flight vehicles. Imagine a spaceport of space traveling vehicles, not just government owned, but commercial. To get to this, (LCS) Launch Control Systems under the Spaceport Command and Control System (SCCS) project is transforming, refurbishing, and upgrading KSC capabilities to access space. LCS has been around since 2007 and currently has an Operational and Development Set being worked on. SCCS is a section of GSDO and is paving the way for new ideas and space vehicle exploration. This report is to demonstrate the roles of a System Administrator and the services completed in this internship experience for LCS.

## II. General Guidelines

Being around since 2007, LCS has systems already in place and many of the tasks require up keeping and maintenance. Adding new user accounts to the backup Development Sets and maintaining tape media rotation storage are among the tasks. Since there are abundant Linux computers available, configuration and maintenance of these systems is required. Testing and learning of the many different configurations can pose security risks so it is recommended that such testing be completed in a virtual environment.

### A. Back up Duties for Development Sets

As the project load increases it is common for other developers to jump aboard. As the system backup increases, new users have to be added to the back-up system. At LCS, applications are commonly used in the back-up process. Tape is a common media used to store data across corporations and agencies due to its low cost, archival storage

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capabilities. Weekly to monthly back-up schedules are consistent, as the amount of data changes slowly daily, a routine schedule of tape rotation for the libraries should not fluctuate severely.

### B. Linux Systems

Red Hat Enterprise Linux is an operating system based off UNIX that is, low cost to obtain,-and constantly has support or upgrades as with any other operating system. That being said, Ubuntu, CentOS, and other Linux distributions are quite common to have in a development/lab-testing environment. One common task is to maintain, change, or create configuration settings of system servers. Linux is unique from other operating systems due to the fact that it commonly uses a command prompt or terminal in order to send a request to complete tasks. Unlike a graphical user interface (GUI) from a friendly user interface, Linux doesn't rely much on GUIs. As a result, changing a Linux based server's IP address would require a little extra knowledge than the common consumer.

### C. Virtual Environment Testing

The safety of NASA employees and the agency is a major priority. Testing is a common practice of the NASA community but to do so effectively, a controlled environment must be established. In the computer world this still applies. Employees need to continue their work and rely on the systems that drive them. The best practice in server testing configuration would be to create a virtual machine (VM). A VM traditionally is a fictive computer system, software based, inside another operating system. They are safe and do not affect the OS in which they reside in. Before configurations on a server can be used, it is wise to test and learn of all the functionalities of unknown operating systems.

## III. Detailed Maintenance

The tasks of the System Admin are of extreme importance as they are commonly asked to diagnose and solve many computer related issues. *Please be aware that in addition to the tasks described above, employees outside of the department are also known to ask of assistance.* System Admins may not be the programmers or creators of computer products bought/used but they may be asked to contact the manufacturer of a product. The following describes the tasks completed in detail:

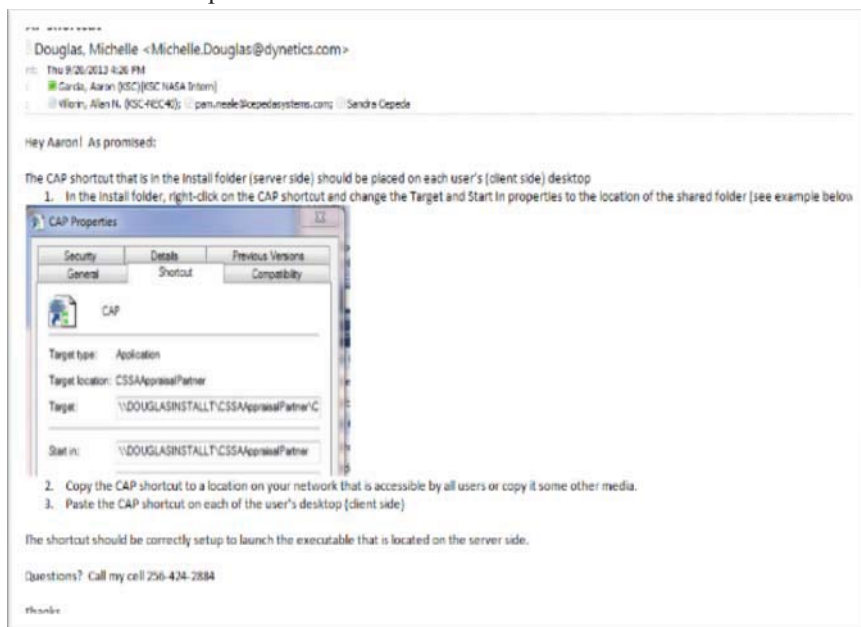


Figure 1.1

### A. Backup of Development Set



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As requests are assigned, either by email or other work order system, *it is imperative to address the client that the situation is being processed*, and a response should be prompt (Fig 1.1). A System Admin may very well be in both the receiving and giving end here. This is an example of what was completed for fellow co-workers from another branch.

User names are a common practice to have in any system and as a result, make it simple to tell the back-up application who to back up. For example, this application uses a simple interface where right clicking a backup directory, followed by clicking properties, inserting the new user name, add, and selecting OK will add any new employees to the backup system. (Fig. 2.1)

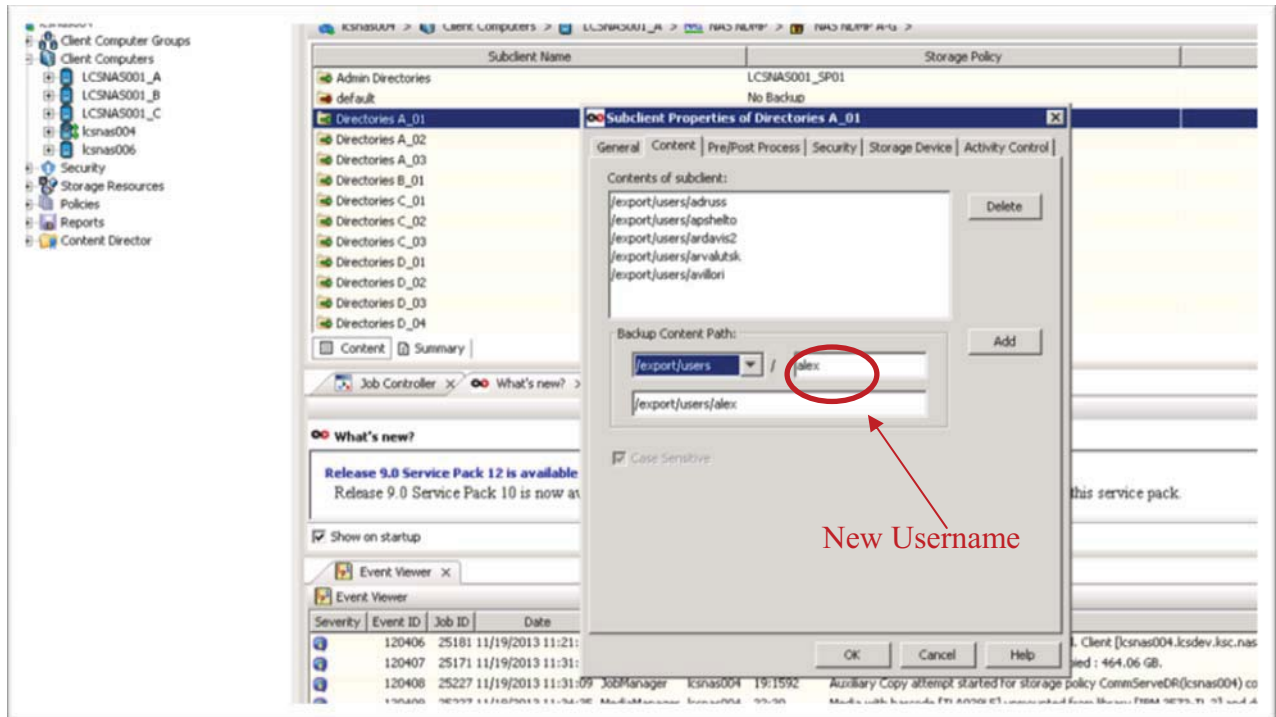


Fig. 2.1

As tapes are filled or completed, the application will notify the Admin to switch out any old tapes with new ones (which are labeled with barcode Fig.2.2). Tapes should be stored according to protocol and in a separate building/facility in case of disaster. The schedule of running the application over the weekend is best. Tapes have a habit of completing on Monday so it's recommended to schedule tape rotation on a Tuesday.



Tape Media



Tape Library



Blade Server

Fig. 2.2

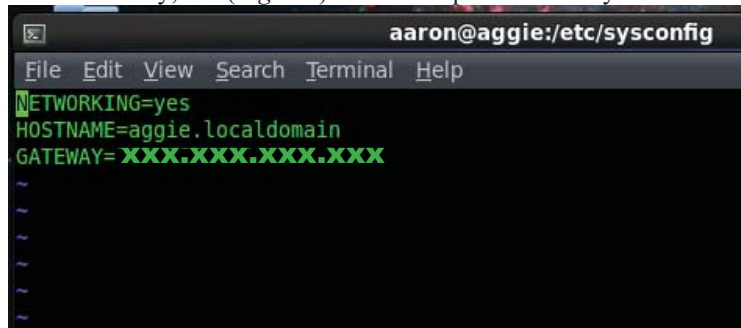


## B. Linux Systems

As the need of more servers is requested, the Linux Operating System is able to accommodate common needs such as web, database, mail, file, printer and blade servers to name a few. So, how does a Linux server get configured? First, a static IP address must be assigned and saved to the server. We need to have a permanent IP address and not a dynamic one. To do this a terminal window may be opened and Network Manager must be stopped: running the command **service NetworkManager stop** should do the trick. Now let's make sure it is saved and doesn't turn on at boot. The command **chkconfig NetworkManager stop** is applied. We need to make sure network service is set to start at boot: **chkconfig network on**. As Network Manager is out of the way, three files need to be edited. They are in the following locations:

```
/etc/sysconfig/network  
/etc/sysconfig/network-scripts/ifcfg-eth0  
/etc/resolv.conf
```

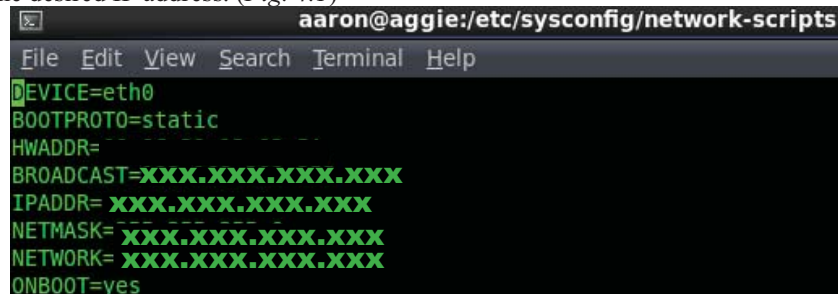
In the `/etc/sysconfig/network` directory, use (Fig. 3.1) as an example and fill in your own credentials.



```
aaron@aggie:/etc/sysconfig  
File Edit View Search Terminal Help  
NETWORKING=yes  
HOSTNAME=aggie.localdomain  
GATEWAY=XXX.XXX.XXX.XXX  
~  
~  
~
```

Fig. 3.1

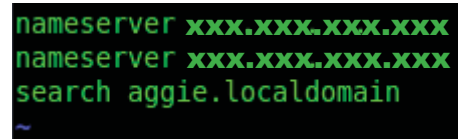
Now, save that and move to the next directory. In the `/etc/sysconfig/network-scripts/ifcfg-eth0`, it should be edited or created to assign the desired IP address. (Fig. 4.1)



```
aaron@aggie:/etc/sysconfig/network-scripts  
File Edit View Search Terminal Help  
DEVICE=eth0  
BOOTPROTO=static  
HWADDR=  
BROADCAST=XXX.XXX.XXX.XXX  
IPADDR=XXX.XXX.XXX.XXX  
NETMASK=XXX.XXX.XXX.XXX  
NETWORK=XXX.XXX.XXX.XXX  
ONBOOT=yes
```

Fig. 4.1

DNS is the final step which is needed to connect to the internet. Make sure to know your DNS server IP addresses and insert them under **nameserver** for the file `/etc/resolv.conf` (Fig 5.1).



```
nameserver XXX.XXX.XXX.XXX  
nameserver XXX.XXX.XXX.XXX  
search aggie.localdomain  
~
```

Fig. 5.1

Now, **service network restart** should be typed in the terminal, and press enter. This should help in assigning a static IP address. This process is similar to the computers configured in the LCC, located at Kennedy Space Center. To be more specific, the Space Port Systems Development Lab uses this process to modify/configure its Linux systems.

## C. Virtual Environment Testing

As the curiosity of mankind has been known to be destructive at times, the need of testing in a controlled environment is also required in the computer world. Linux uses a virtual application called Virtual Machine Manager (VMM) to create VMs. The first steps in order to install VMM in a CentOS Linux system would be to install the following packages: (Fig. 6.1)

A **yum install** followed by the package name should work fine.

Package	Description
qemu-kvm	The main KVM package
python-virtinst	Command line tools and libraries for creating VMs
virt-manager	GUI VM administration tool
virt-top	Command for VM statistics
virt-viewer	GUI connection to configured VMs
libvirt	C language toolkit with the libvirtd service
libvirt-client	C language toolkit for VM clients

Figure 6.1

It may be necessary to run **service libvirtd start, lsmod | grep kvm, kvm, or modprobe kvm** after the above packages have been installed. Now clicking on Applications, scrolling down will show Virtual Machine Manager. As seen in (Fig. 7.1), there is the potential to run a virtual machine inside another VM. In this example, there is the host OS, while CentOS is running from a VM, and inside that, Virtual Machine Manager is ready to install any OS.

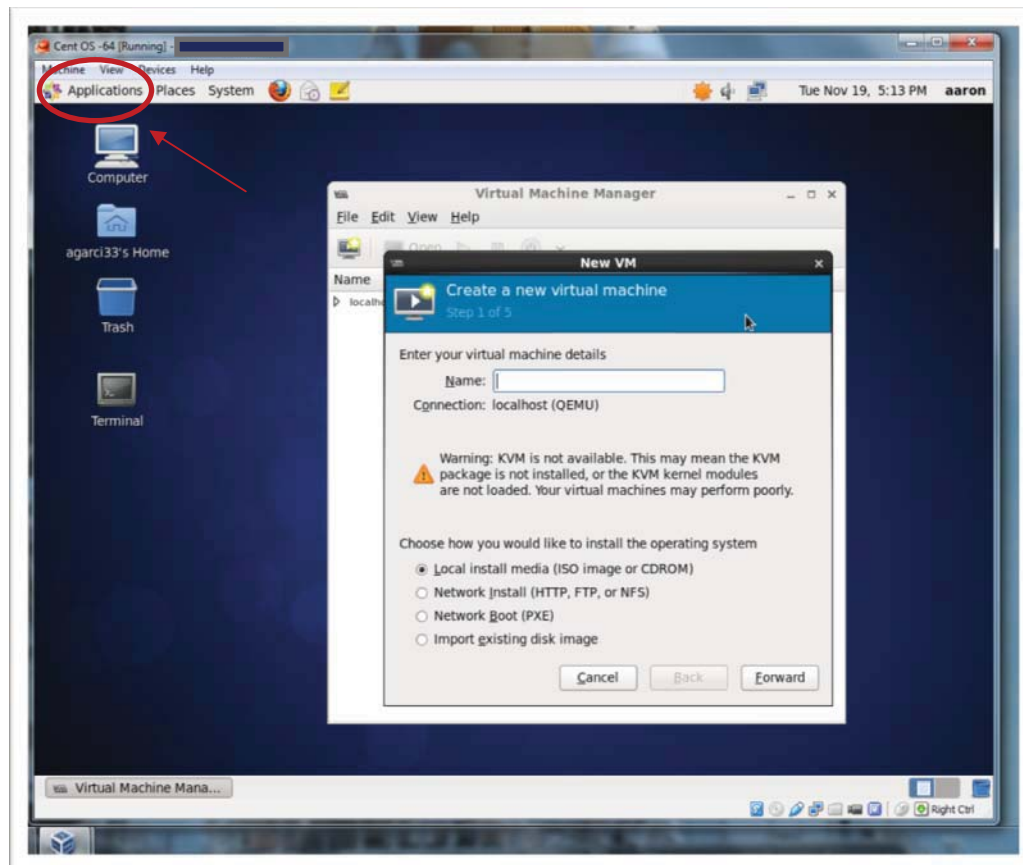
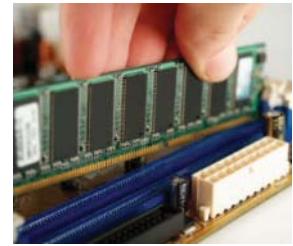


Fig.7.1





This is usually the best route in testing, manipulating and learning from an unknown OS. As a reminder, don't forget to upgrade RAM as the VMs may use up memory resources quite quickly. Upgrading RAM to the systems was also completed for the Spaceport Process Systems Development Lab (SPSDL) in the LCC.



#### IV. Career Development

The internship experience at the Kennedy Space Center under the NE-C Division was an amazing experience. Many of the learning experiences gained cannot be learned in a classroom. In the Backup Development task, communication is key when dealing with customers. A customer wants someone who knows how to listen, solve the problem quickly, and efficiently. Being able to help other clients in other branches/subdivisions creates confidence both in the client relationship and System Admin him/herself. As a result, the clients in the OSBII building were fulfilled with great satisfaction on the services and applications installed. The clients may now work on their own tasks assigned to them.

Important backup systems were maintained for the development work of LCS through the use of tape media. Knowing that years of work are stored and if need be, can be restored is a relief for everyone. Future projects can also use these backups to build upon an existing product.

Learning of the Linux server system is good research for any System Admin. Having the ability to integrate this OS into any organization is a tremendous trait to obtain. The need will continue to grow as more companies and agencies use Linux in their infrastructure. The opportunity to work with such expensive equipment diligently is wisdom gained. The mentors, co-workers are also a contributing factor in this learning opportunity. Learning how to ask for guidance thus receiving it, is a relief to any new intern, who craves the ability to complete the desired tasks.

Trial and error are a contributing factor in any learning environment. Experimenting with many multiple system configurations should not affect or cost any agency/company money, resources, or reliability. Through the use of VMs it is possible to expand knowledge and gain practice without jeopardizing current operating systems. From this, the knowledge in learning how to change dynamic IP addresses into static resulted in the systems now present in the SPSDL. Future trial and error projects may now be put into effect in this testing facility.

#### V. Conclusion

The LCS Development Sets are to produce a finished product that will become operational for future space vehicle launches. Creating restore points of this system is crucial, since the presence of disaster is common along the Florida Space Coast. Delays can be cut short and while restore points are of extreme importance, deletion of files through human error can be eliminated. The use of tape media provides a reliable source of insurance.

Tech support is a valuable tool most departments have, either by outsourcing or within the organization, and with the fore coming of new technology is may be difficult for workers to install, upgrade, or resolve their own tech needs. It is essential to have civil servants or contractors with this trait available.

The SPSDL is a new testing environment that will be responsible for future ingenuity across Kennedy Space Center. While it's still in the process of being completed, it is expected that new innovative concepts will be brought to reality.